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(54) **Reversible ratchet wrench**

Umkehrbarer Ratschenschlüssel

Clé à rochet réversible

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(56) References cited:
**US-A1- 2009 038 444** **US-A1- 2011 107 879**

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## Description

### BACKGROUND OF THE INVENTION

**[0001]** The present invention relates to a ratchet wrench and, more particularly, to a reversible ratchet wrench according to the preamble of claim 1. Such a ratchet wrench is generally known by US2009/0038444 A1.

**[0002]** U.S. Patent No. 6,629,477 discloses a reversible ratchet wrench including a handle and a driving member rotatably mounted in the handle. The driving member can couple with a socket for engaging with a fastener, such as a screw or nut. The fastener can be rotated when a user rotates the handle. A retaining member is slideably received in a retaining recess in the handle and selectively engages with the driving member. A direction control member is rotatably mounted in a receiving chamber of the handle. A pressing member and an elastic member are mounted in a first receiving recess in the direction control member. The pressing member is biased by the elastic member to press against the retaining member. When the direction control member is rotated, the position of the retaining member pressed by the pressing member can be changed to change the driving direction of the driving member.

**[0003]** In assembly, the direction control member is firstly placed into the receiving chamber, and the pressing member and the elastic element are passed through the receiving chamber into the first receiving recess. Finally, the retaining member and the driving member are mounted to the handle in sequence. The pressing member is retained in the handle to prevent the direction control member from disengaging from the receiving chamber. Grease is filled between the retaining member and the driving member to permit smooth engagement and smooth disengagement therebetween. The reversible ratchet wrench cannot be completely sealed during assembly such that oil from the outside and scraps generated by friction between the driving member and the retaining member accumulate between the driving member and the retaining member, adversely affecting the engagement and disengagement therebetween. In a case that the retaining member cannot disengage from the driving member due to improper operation by a user, the pressing member will deform and damage due to excessive pressing by the retaining member if the user keeps applying a rotational force in a reverse direction. Thus, the reversible ratchet wrench malfunctions and cannot be used. Furthermore, when the pressing member is pressed into the first receiving recess due to excessive pressing, the pressing member loses its limiting function, leading to disengagement of the direction control member from the receiving chamber. If the user is working with his or her head raised for tightening a fastener above his or her head, the direction control member falling from the receiving chamber could hit the head and endangers the user.

**[0004]** Furthermore, water or sweat could enter the reversible ratchet wrench after a period of time of use, leading to rusting of the driving member and the retaining member and, thus, adversely affecting smooth engagement and/or disengagement therebetween, which also causes damage to the reversible ratchet wrench.

**[0005]** Thus, a need exists for a novel reversible ratchet wrench that mitigates and/or obviates the above disadvantages.

### BRIEF SUMMARY OF THE INVENTION

**[0006]** This need and other problems in the field of durable reversible wrenches are solved by a reversible ratchet wrench according to claim 1 including a body having an operative portion and a driving end connected to the operative portion. The operative portion is adapted to be gripped by a user. The driving end includes a receiving space and a compartment intercommunicated with the receiving space. The body further includes a hole intercommunicating the compartment with an outside. A driving member is mounted in the receiving space and is rotatable about a rotational axis relative to the driving end of the body. The driving member includes a driving portion adapted for directly or indirectly driving a fastener. The driving member further includes an annular toothed portion on an outer periphery thereof. A pawl is slideably received in the compartment. The pawl includes a first side having a toothed portion disengageably engaged with the annular toothed portion of the driving member. The pawl further includes a second side. A switch button is received in the hole of the body and is pivotable relative to the body about a pivotal axis parallel to the rotational axis. The switch button includes a first side facing the compartment and a second side opposite to the first side. The switch button further includes a pressing member receptacle extending from the first side towards the second side. An elastic element is received in the pressing member receptacle. A pressing member is received in the pressing member receptacle and has a first end located outside of the pressing member receptacle. The first end of the pressing member has a first spacing to the first side of the switch button. The first end of the pressing member is biased by the elastic element to press against the second side of the pawl, causing engagement between the toothed portion of the pawl and the annular toothed portion of the driving member. A protrusion is provided on the first side of the switch button and includes a contact portion having a second spacing to the first side of the switch button.

**[0007]** The switch button is operable to pivot relative to the body to change a driving direction and a non-driving direction of the body. The driving member and the fastener coupled to the driving member are adapted to rotate jointly with the body while the body rotates in the driving direction. The driving member and the fastener coupled to the driving member are adapted to remain still when the body rotates in the non-driving direction.

**[0008]** The pawl slides in the compartment and is pressed by the pressing member to disengage from the annular toothed portion of the driving member while the body rotates in the non-driving direction, and the first spacing of the pressing member is not smaller than the second spacing of the protrusion.

**[0009]** If the pawl slides in the compartment while the body rotates in the non-driving direction and if the pawl pressed by the pressing member does not disengage from the annular toothed portion of the driving member, the contact portion of the protrusion presses against the pawl to disengage the pawl from the annular toothed portion of the driving member when the elastic element is compressed to an extent in which the first spacing of the pressing member is not larger than the second spacing.

**[0010]** In examples, the switch button further includes a fixing member receptacle extending from the first side towards the second side of the switch button. A fixing member is received in the fixing member receptacle and has a first end exposed outside of the fixing member receptacle. The first end of the fixing member forms the protrusion.

**[0011]** In an example, the fixing member receptacle extends from the first side towards but spaced from the second side of the switch button, and the fixing member further includes a second end abutting an end wall of the fixing member receptacle.

**[0012]** In another example, the fixing member receptacle extends from the first side through the second side of the switch button, and the fixing member further includes a second end pivotably abutting an abutment wall of the hole of the body. The second side of the switch button pivotably abuts the abutment wall.

**[0013]** The fixing member can be solid and have circular or rectangular cross sections.

**[0014]** Preferably, the fixing member has a hardness larger than a hardness of the pawl. Preferably, the switch button has a hardness larger than a hardness of the pawl.

**[0015]** In examples, the pressing member receptacle and the fixing member receptacle extend perpendicularly to the pivotal axis, are parallel to each other, and are spaced from each other along the pivotal axis.

**[0016]** In examples, the pressing member receptacle extends from the first side towards but spaced from the second side of the switch button. The elastic element further has a second end abutting an end wall of the pressing member receptacle. The second side of the pawl includes a recessed portion. The first end of the pressing member presses against the recessed portion.

**[0017]** In examples, the body includes two limiting portions between the compartment and the hole. The two limiting portions are spaced from each other in a width direction perpendicular to the pivotal axis. Pivotal movement of the switch button about the pivotal axis is stopped when the pressing member contacts and is stopped by one of the two limiting portions.

**[0018]** Illustrative embodiments will become clearer in light of the following detailed description described in connection with the drawings.

## DESCRIPTION OF THE DRAWINGS

**[0019]** The illustrative embodiments may best be described by reference to the accompanying drawings where:

FIG. 1 is a partial, perspective view of a reversible ratchet wrench of a first embodiment according to the present invention.

FIG. 2 is a partial, exploded, perspective view of the reversible ratchet wrench of FIG. 1.

FIG. 3 is a partial, cross sectional view of the reversible ratchet wrench of FIG. 1.

FIG. 4 is a cross sectional view taken along section line 4-4 of FIG. 3.

FIG. 5 is a cross sectional view taken along section ling 5-5 of FIG. 3.

FIG. 6 is a view similar to FIG. 4, illustrating disengagement of a pawl from a driving member during normal operation of the reversible ratchet wrench of FIG. 1.

FIG. 7 is a view similar to FIG. 5, illustrating disengagement of the pawl from the driving member during normal operation of the reversible ratchet wrench of FIG. 1.

FIG. 8 is a view similar to FIG. 6, illustrating engagement between the pawl and the driving member of the reversible ratchet wrench of FIG. 1 in a case of oil between the pawl and the driving member.

FIG. 9 is a view similar to FIG. 8, illustrating operation of the reversible ratchet wrench of FIG. 1 in a case of oil between the pawl and the driving member, with a pressing member pressing against the pawl.

FIG. 10 is a view similar to FIG. 5, illustrating operation of the reversible ratchet wrench of FIG. 1 in a case of oil between the pawl and the driving member, with a fixing member pressing against the pawl to disengage the pawl from the driving member.

FIG. 11 is a partial, cross sectional view of a reversible ratchet wrench of a second embodiment according to the present invention.

FIG. 12 is a partial, exploded, perspective view of a reversible ratchet wrench of a third embodiment according to the present invention.

**[0020]** All figures are drawn for ease of explanation of the basic teachings only; the extensions of the figures with respect to number, position, relationship, and dimensions of the parts to form the illustrative embodiments will be explained or will be within the skill of the art after the following teachings have been read and understood. Further, the exact dimensions and dimensional proportions to conform to specific force, weight, strength, and similar requirements will likewise be within the skill of the art after the following teachings have been read and understood.

**[0021]** Where used in the various figures of the drawings, the same numerals designate the same or similar parts. Furthermore, when the terms "first", "second", "bottom", "side", "end", "portion", "spacing", "length", "width", "thickness", and similar terms are used herein, it should be understood that these terms have reference only to the structure shown in the drawings as it would appear to a person viewing the drawings and are utilized only to facilitate describing the illustrative embodiments.

## DETAILED DESCRIPTION OF THE INVENTION

**[0022]** FIGS. 1-3 show a reversible ratchet wrench 10 of a first embodiment according to the present invention. Reversible ratchet wrench 10 includes a body 20, a driving member 30, and a ratcheting device 40.

**[0023]** Body 20 includes an operative portion 21 and a driving end 22 connected to handle 21. Operative portion 21 is adapted to be gripped by a user. Driving end 22 includes first and second sides spaced from each other in a thickness direction. Driving end 22 further includes a receiving space 23 extending from the first side through the second side. Driving end 22 further includes a compartment 24 located between the first and second sides of body 20 and intercommunicated with the receiving space 23. Compartment 24 extends towards operative portion 21 in a length direction perpendicular to the thickness direction. Body 20 further includes a hole 25 extending from the first side towards but spaced from the second side of body 20. Hole 25 intercommunicates compartment 24 with the outside. Hole 25 includes an abutment wall 26 facing compartment 24. Abutment wall 26 is arcuate in this embodiment. Body 20 further includes two limiting portions 27 between compartment 24 and hole 25. Limiting portions 27 are spaced from each other in a width direction perpendicular to the length and thickness directions.

**[0024]** Driving member 30 is mounted in receiving space 23 of body 20. Driving member 30 is rotatable about a rotational axis C relative to driving end 22 of body 20. Rotational axis C is parallel to the thickness direction in this embodiment. Driving member 30 includes a driving portion 31 adapted for directly or indirectly driving a fastener. Driving portion 31 surrounds rotational axis C. In the form shown in FIGS. 1-12, driving portion 31 includes an inner periphery having a plurality of protrusions and recessed portions. Other forms of driving portion 31 can be used. Driving member 30 further includes an annular toothed portion 32 on an outer periphery thereof.

**[0025]** Ratcheting device 40 includes a switch button 41, a pawl 42, an elastic element 43, a pressing member 44, and a protrusion provided on switch button 41. Switch button 41 is received in hole 25 of body 20. Switch button 41 is pivotable relative to body 20 about a pivotal axis S parallel to rotational axis C and perpendicular to the width direction. Switch button 41 includes a first side 4101 facing compartment 24 and a second side 4102 opposite to first side 4101. First side 4010 of switch button 41 is intermediate pawl 42 and second side 4102 of switch button 41. Switch button 41 further includes a pressing member receptacle 411 extending from first side 4101 towards second side 4102. In this embodiment, pressing member receptacle 411 extends from first side 4101 towards but spaced from second side 4102. Second side 4102 of switch button 41a pivotably abuts abutment wall 26.

**[0026]** In this embodiment, switch button 41 further includes a fixing member receptacle 412 extending from first side 4101 towards but spaced from second side 4102 of switch button 41. Pressing member receptacle 411 and fixing member receptacle 412 extend perpendicularly to pivotal axis S, are parallel to each other, and are spaced from each other along pivotal axis S.

**[0027]** Pawl 42 is slideably received in compartment 24 of body 20 and is located between driving member 30 and switch button 41. Pawl 42 includes a first side having a toothed portion 421 disengageably engaged with annular toothed portion 32 of driving member 30. Pawl 42 further includes a second side. In this embodiment, the second side of pawl 42 includes a recessed portion 422.

**[0028]** Elastic element 43 is received in pressing member receptacle 411. Pressing member 44 is also received in pressing member receptacle 411 and is biased by elastic element 43. Pressing member 44 has a first end located outside of pressing member receptacle 411 and a second end received in pressing member receptacle 411. An end of elastic element 43 abuts an end wall of pressing member receptacle 411. The other end of elastic element 43 abuts the second end of pressing member 44. In this embodiment, pressing member 44 includes a receptacle having an end wall against which the other end of elastic element 43 abuts. The first end of pressing member 44 is biased by elastic element 43 into recessed portion 422 of pawl 42 to thereby press against the second side of pawl 42, causing engagement between toothed portion 421 of pawl 42 and annular toothed portion 32 of driving member 30. The first end of pressing member 44 has a first spacing L1 to first side 4101 of switch button 41. Pressing member 44 is slideable in pressing member receptacle 411 in a radial direction perpendicular to pivotal axis S, preventing switch button 41 from disengaging from hole 25 along pivotal axis S. Furthermore, pivotal movement of switch button 41 about pivotal axis S is stopped when pressing member 44 contacts and is stopped by one of limiting portions 27.

**[0029]** A fixing member 45 is received in fixing member receptacle 412 and has a first end exposed outside of fixing member receptacle 412. The first end of fixing member 45 forms the protrusion on first side 4101 of switch button 41. Fixing member 45 further includes a second end abutting an end wall of fixing member receptacle 412. The protrusion includes a contact portion 451 having a second spacing L2 to first side 4101 of switch button 41. Contact portion 451 is normally spaced from pawl 42 but can press against recessed portion 422 of pawl 42 if pawl 42 malfunctions. Both of fixing member 45 and switch button 41 have a hardness larger than a

hardness of pawl 42. In this embodiment, fixing member 45 is solid and has circular cross sections.

**[0030]** Switch button 41 can be operated to pivot relative to body 20 to change a driving direction and a non-driving direction of body 20. Specifically, when body 20 rotates in the driving direction, a fastener coupled with driving portion 31 of driving member 30 rotate jointly with body 20 in the driving direction. On the other hand, when body 20 rotates in the non-driving direction, the fastener and driving member 30 do not rotate and remain still. Operation of switch button 41 and body 20 can be appreciated by a person having ordinary skill in the art.

**[0031]** With reference to FIGS. 6 and 7, during normal operation, pawl 42 slides in compartment 24 and is pressed by pressing member 44 to disengage from annular toothed portion 32 of driving member 30 while body 20 rotates in the non-driving direction, and first spacing L1 of pressing member 44 is not smaller than second spacing L2 of the protrusion. Specifically, when body 20 rotates in the non-driving direction, pawl 42 cannot drive driving member 30 to rotate. Rather, driving member 30 pushes pawl 42 away from driving member 30. Thus, pawl 42 disengages from driving member 30, pushes pressing member 44 away from driving member 30, and compresses elastic element 43. The protrusion formed by fixing member 45 does not contact pawl 42.

**[0032]** With reference to FIGS. 8-10, in a case that oil or direct enters body 20 and accumulates between pawl 42 and driving member 30, toothed portion 421 of pawl 42 cannot smoothly engage with or disengage from annular toothed portion 32 of driving member 30. Namely, pawl 42 gets stuck on driving member 30. With reference to FIG. 8, when body 20 is rotated in the non-driving direction, pawl 42 moves away from driving member 30. With reference to FIGS. 9 and 10, when elastic element 43 is compressed to an extent in which first spacing L1 of pressing member 44 is not larger than second spacing L2 of the protrusion, contact portion 451 of the protrusion presses against recessed portion 422 of pawl 42 to forcibly disengage toothed portion 421 of pawl 42 from annular toothed portion 32 of driving member 30. This avoids excessive compression of pressing member 44 by pawl 42 while the user still continuously rotates reversible ratchet wrench 10. Thus, deformation of pressing member 44 resulting from excessive pressure is avoided, preventing reversible ratchet wrench 10 from malfunctioning and damage.

**[0033]** Likewise, if toothed portion 421 of pawl 42 cannot smoothly engage with or disengage from annular toothed portion 32 of driving member 30 due to rusting of pawl 42 and/or driving member 30, contact portion 451 of the protrusion can press against recessed portion 422 of pawl 42 to forcibly disengage pawl 42 from driving member 30, avoiding reversible ratchet wrench 10 from malfunctioning and damage. Furthermore, this provision also assures sliding movement of pressing member 44 in pressing member receptacle 411 while preventing switch button 41 from disengaging from hole 25.

**[0034]** After contact portion 451 of the protrusion impinges recessed portion 422 of pawl 42, toothed portion 421 of pawl 42 is forcibly disengaged from annular toothed portion 32 of driving member 30, such that reversible ratchet wrench 10 returns to the normal state shown in FIGS. 4 and 5. Pressing member 44 is biased by elastic element 43 to press against pawl 42 such that pawl 42 reengages with driving member 30, effectively avoiding deformation of pressing member 44 resulting from non-smooth engagement or disengagement between pawl 42 and driving member 30 while preventing switch button 41 from disengaging from hole 25, prolonging the service life of reversible ratchet wrench 10.

**[0035]** FIG. 11 shows a reversible ratchet wrench 10 of a second embodiment according to the present invention. The second embodiment is substantially the same as the first embodiment. Specifically, fixing member receptacle 412a of the second embodiment extends from first side 4101a through second side 4102a of switch button 41a. Second side 4102a of switch button 41a and the second end of fixing member 45a pivotably abut abutment wall 26 of body 20. The first end of pressing member 44 has a first spacing L1 to first side 4101a of switch button 41a. The first end of fixing member 45a forms the protrusion on first side 4101a of switch button 41a. The protrusion includes a contact portion 451a having a second spacing L2 to first side 4101a of switch button 41a. Contact portion 451a is normally spaced from pawl 42a but can press against recessed portion 422 of pawl 42 if pawl 42 malfunctions. Operation of the second embodiment is similar to the first embodiment. Namely, during normal operation, pawl 42 slides in compartment 24 and is pressed by pressing member 44 to disengage from annular toothed portion 32 of driving member 30 while body 20 rotates in the non-driving direction, and first spacing L1 of pressing member 44 is not smaller than second spacing L2 of the protrusion. Nevertheless, when pawl 42 slides in compartment 24 while body 20 rotates in the non-driving direction, if pawl 30 pressed by pressing member 44 does not disengage from annular toothed portion 32 of driving member 30, contact portion 451a of the protrusion presses against pawl 42 to forcibly disengage pawl 42 from annular toothed portion 32 of the driving member 30 when elastic element 43 is compressed to an extent in which first spacing L1 of pressing member 44 is not larger than second spacing L2 of the protrusion.

**[0036]** Since the second end of fixing member 45a abuts abutment wall 26, when contact portion 451a of fixing member 45a presses against pawl 42, switch button 41a does not have to withstand the reactive force from fixing member 45a. Rather, abutment wall 26 of body 20 withstands the reactive force. Thus, switch button 41a can be made of a material having a lower hardness (but still larger than the hardness of pawl 42), reducing the overall manufacturing costs of reversible ratchet wrench 10.

**[0037]** FIG. 12 shows a reversible ratchet wrench of a third embodiment according to the present invention. The

third embodiment is substantially the same as the first embodiment except that fixing member 45b is solid and has rectangular cross sections.

**[0038]** In view of the foregoing, when pawl 42 and driving member 30 malfunctions, contact portion 451, 451a of the protrusion presses against recessed portion 422 of pawl 42 to forcibly disengage toothed portion 421 of pawl 42 from annular toothed portion 32 of driving member 30. This avoids excessive compression of pressing member 44 by pawl 42 while the user still continuously rotates reversible ratchet wrench 10. Thus, deformation of pressing member 44 resulting from excessive pressure is avoided, preventing reversible ratchet wrench 10 from malfunctioning and damage.

**[0039]** Thus since the illustrative embodiments disclosed herein may be embodied in other specific forms without departing from the general characteristics thereof, some of which forms have been indicated, the embodiments described herein are to be considered in all respects illustrative and not restrictive. The scope is to be indicated by the appended claims, rather than by the foregoing description, and all changes which come within the scope of the claims are intended to be embraced therein.

## Claims

**1.** A reversible ratchet wrench comprising:

a body (20) including an operative portion (21) and a driving end (22) connected to the operative portion (21), with the operative portion (21) adapted to be gripped by a user, with the driving end (22) including a receiving space (23) and a compartment (24) intercommunicated with the receiving space (23), with the body (20) further including a hole (25) intercommunicating the compartment (24) with an outside;

a driving member (30) mounted in the receiving space (23), with the driving member (30) rotatable about a rotational axis (C) relative to the driving end (22) of the body (20), with the driving member (30) including a driving portion (31) adapted for directly or indirectly driving a fastener, with the driving member (30) further including an annular toothed portion (32) on an outer periphery thereof;

a pawl (42) slideably received in the compartment (24), with the pawl (42) including a first side having a toothed portion (421) disengageably engaged with the annular toothed portion (32) of the driving member (30), with the pawl (42) further including a second side;

a switch button (41; 41a) received in the hole (25) of the body (20), with the switch button (41; 41a) pivotable relative to the body (20) about a pivotal axis (S) parallel to the rotational axis (C), with the switch button (41; 41a) including a first side (4101; 4101a) facing the compartment (24) and a second side (4102; 4102a) opposite to the first side (4101; 4101a), with the switch button (41; 41a) further including a pressing member receptacle (411; 411a) extending from the first side (4101; 4101a) towards the second side (4102; 4102a);

an elastic element (43) received in the pressing member receptacle (411; 411a); and

a pressing member (44) received in the pressing member receptacle (411; 411a) and having a first end located outside of the pressing member receptacle (411; 411a), with the first end of the pressing member (44) having a first spacing (L1) to the first side (4101; 4101a) of the switch button (41; 41a), with the first end of the pressing member (44) biased by the elastic element (43) to press against the second side of the pawl (42), causing engagement between the toothed portion (421) of the pawl (42) and the annular toothed portion (32) of the driving member (30); and

a protrusion provided on the first side (4101; 4101a) of the switch button (41; 41a) and including a contact portion (451; 451a) having a second spacing (L2) to the first side (4101; 4101a) of the switch button (41; 41a),

wherein the switch button (41; 41a) is operable to pivot relative to the body (20) to change a driving direction and a non-driving direction of the body (20), wherein the driving member (30) and the fastener coupled to the driving member (30) are adapted to rotate jointly with the body (20) while the body (20) rotates in the driving direction, and wherein the driving member (30) and the fastener coupled to the driving member (30) are adapted to remain still when the body (20) rotates in the non-driving direction,

wherein the pawl (42) slides in the compartment (24) and is pressed by the pressing member (44) to disengage from the annular toothed portion (32) of the driving member (30) while the body (20) rotates in the non-driving direction, and the first spacing (L1) of the pressing member (44) is not smaller than the second spacing (L2) of the protrusion,

**characterized in that** if the pawl (42) slides in the compartment (24) while the body (20) rotates in the non-driving direction and if the pawl (42) pressed by the pressing member (44) does not disengage from the annular toothed portion (32) of the driving member (30), the contact portion (451; 451a) of the protrusion presses against the pawl (42) to disengage the pawl (42) from the annular toothed portion (32) of the driving member (30) when the elastic element (43) is compressed to an extent in which the first spacing (L1) of the pressing member (44) is not larger than the second spacing (L2).

2. The reversible ratchet wrench as claimed in claim 1, with the switch button (41; 41a) further including a fixing member receptacle (412; 412a) extending from the first side (4101; 4101a) towards the second side (4102; 4102a) of the switch button (41; 41a), with a fixing member (45; 45a; 45b) received in the fixing member receptacle (412; 412a) and having a first end exposed outside of the fixing member receptacle (412; 412a), and with the first end of the fixing member (45; 45a; 45b) forming the protrusion.

3. The reversible ratchet wrench as claimed in claim 2, with the fixing member receptacle (412) extending from the first side (4101) towards but spaced from the second side (4102) of the switch button (41), and with the fixing member (45) further including a second end abutting an end wall of the fixing member receptacle (412).

4. The reversible ratchet wrench as claimed in claim 2, with the hole (25) of the body (20) including an abutment wall (26), with the second side (4102a) of the switch button (41a) pivotably abutting the abutment wall (26), with the fixing member receptacle (412a) extending from the first side (4101a) through the second side (4102a) of the switch button (41a), and with the fixing member (45a) further including a second end pivotably abutting the abutment wall (26).

5. The reversible ratchet wrench as claimed in claim 2, wherein the fixing member (45; 45a) is solid and has circular cross sections.

6. the reversible ratchet wrench as claimed in claim 2, wherein the fixing member (45b) is solid and has rectangular cross sections.

7. The reversible ratchet wrench as claimed in claim 3, wherein each of the fixing member (45) and the switch button (41) has a hardness larger than a hardness of the pawl (42).

8. The reversible ratchet wrench as claimed in claim 4, wherein the fixing member (45a) has a hardness larger than a hardness of the pawl (42).

9. The reversible ratchet wrench as claimed in claim 2, wherein the pressing member receptacle (411; 411a) and the fixing member receptacle (412; 412a) extend perpendicularly to the pivotal axis (S), are parallel to each other, and are spaced from each other along the pivotal axis (S).

10. The reversible ratchet wrench as claimed in claim 1, with the pressing member receptacle (411; 411a) extending from the first side (4101; 4101a) towards but spaced from the second side (4102; 4102a) of the switch button (41; 41a), with the elastic element (43) further having a second end abutting an end wall of the pressing member receptacle (411; 411a), with the second side of the pawl (42) including a recessed portion (422), and with the first end of the pressing member (44) pressing against the recessed portion (422).

11. The reversible ratchet wrench as claimed in claim 3, with the body (20) including two limiting portions (27) between the compartment (24) and the hole (25), and with the two limiting portions (27) spaced from each other in a width direction perpendicular to the pivotal axis (S), wherein pivotal movement of the switch button (41; 41a) about the pivotal axis (S) is stopped when the pressing member (44) contacts and is stopped by one of the two limiting portions (27).

**Patentansprüche**

1. Umschaltbarer Ratschenschlüssel aufweisend:

einen Körper (20) mit einem Wirkabschnitt (21) und einem Antriebsende (22), das mit dem Wirkabschnitt (21) verbunden ist, wobei der Wirkabschnitt (21) angepasst ist, um von einem Benutzer gegriffen zu werden, wobei das Antriebsende (22) einen Aufnahmeraum (23) und eine Kammer (24), die mit dem Aufnahmeraum (23) in Verbindung steht, aufweist, wobei der Körper (20) ferner ein Loch (25) aufweist, welches die Kammer (24) mit einer Außenseite verbindet;
ein Antriebsteil (30), welches in dem Aufnahmeraum (23) montiert ist, wobei das Antriebsteil (30) um eine Rotationsachse (C) relativ zu dem Antriebsende (22) des Körpers (20) rotierbar ist, wobei das Antriebsteil (30) einen Antriebsabschnitt (31) aufweist, der angepasst ist, um ein Befestigungselement direkt oder indirekt anzutreiben, wobei das Antriebsteil (30) ferner einen ringförmigen gezahnten Abschnitt (32) an einem Außenumfang davon aufweist;
eine Klinke (42), die verschiebbar in der Kammer (24) aufgenommen ist, wobei die Klinke (42) eine erste Seite aufweist, die einen gezahnten Abschnitt (421) hat, welcher lösbar mit dem ringförmigen gezahnten Abschnitt (32) des Antriebsteils (30) im Eingriff ist, wobei die Klinke (42) ferner eine zweite Seite aufweist;
einen Schaltknopf (41; 41a), welcher in dem Loch (25) des Körpers (20) aufgenommen ist, wobei der Schaltknopf (41; 41a) relativ zu dem Körper (20) um eine Schwenkachse (S), die parallel zu der Rotationsachse (C) ist, schwenkbar ist, wobei der Schaltknopf (41; 41a) eine erste Seite (4101; 4101a), die der Kammer (24) zugewandt ist, und eine zweite Seite (4102, 4102a)

gegenüber der ersten Seite (4101; 4101a) aufweist, wobei der Schaltknopf (41; 41a) ferner eine Drückelementbuchse (411; 411a) aufweist, die sich von der ersten Seite (4101; 4101a) zu der zweiten Seite hin (4102; 4102a) erstreckt;
ein elastisches Teil (43), welches in der Drückelementbuchse (411; 411a) aufgenommen ist; und
ein Drückelement (44), das in der Drückelementbuchse (411; 411a) aufgenommen ist und ein erstes Ende hat, das außerhalb der Drückelementbuchse (411; 411a) angeordnet ist, wobei das erste Ende des Drückelements (44) einen ersten Abstand (L1) zu der ersten Seite (4101; 4101a) des Schaltknopfes (41; 41a) hat, wobei das erste Ende des Drückelements (44) von dem elastischen Teil (43) vorgespannt ist, um gegen die zweite Seite der Klinke (42) zu drücken, wodurch ein Eingreifen zwischen dem gezahnten Abschnitt (421) der Klinke (42) und dem ringförmigen Zahnabschnitt (32) des Antriebsteils (30) bewirkt wird; und
einen Vorsprung, der an der ersten Seite (4101; 4101a) des Schaltknopfes (41; 41a) bereitgestellt ist und die einen Kontaktabschnitt (451; 451a) aufweist, der einen zweiten Abstand (L2) zu der ersten Seite (4101; 4101a) des Schaltknopfes (41; 41a) hat,

wobei der Schaltknopf (41; 41a) betreibbar ist, um relativ zu dem Körper (20) zu schwenken, um zwischen einer Antriebsrichtung und einer Nicht-Antriebsrichtung des Körpers (20) zu wechseln, wobei das Antriebsteil (30) und das mit dem Antriebsteil (30) verbundene Befestigungselement angepasst sind, um gemeinsam mit dem Körper (20) zu rotieren, während der Körper (20) in der Antriebsrichtung rotiert, und wobei das Antriebsteil (30) und das mit dem Antriebsteil (30) verbundene Befestigungselement angepasst sind, um stillzustehen, während der Körper (20) in der Nicht-Antriebsrichtung rotiert,
wobei sich die Klinke (42) in die Kammer (24) verschiebt und durch das Drückelement (44) gedrückt wird, um sich von dem ringförmigen gezahnten Abschnitt (32) des Antriebsteils (30) zu lösen, während der Körper (20) in der Nicht-Antriebsrichtung rotiert, und der erste Abstand (L1) des Drückelements (44) nicht kleiner ist als der zweite Abstand (L2) des Vorsprungs,
**dadurch gekennzeichnet, dass**, wenn die Klinke (42) sich in die Kammer (24) verschiebt, während der Körper (20) in der Nicht-Antriebsrichtung rotiert, und wenn die von dem Drückelement (44) gedrückte Klinke (42) sich nicht von dem ringförmigen gezahnten Abschnitt (32) des Antriebsteils (30) löst, der Kontaktabschnitt (451; 451a) des Vorsprungs gegen die Klinke (42) drückt, um die Klinke (42) von dem ringförmigen gezahnten Abschnitt (32) des Antriebsteils (30) zu lösen, wenn das elastische Teil (43) in einem Ausmaß zusammengedrückt wird, sodass der erste Abstand (L1) des Drückelements (44) nicht größer ist als der zweite Abstand (L2).

**2.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 1, wobei der Schalterknopf (41; 41a) ferner eine Fixierelementbuchse (412; 412a) aufweist, die sich von der ersten Seite (4101; 4101a) zu der zweiten Seite (4102; 4102a) des Schaltknopfes (41; 41a) hin erstreckt, wobei ein Fixierelement (45; 45a; 45b) in der Fixierelementbuchse (412; 412a) aufgenommen ist und ein erstes Ende, das außerhalb der Fixierelementbuchse (412; 412a) freiliegt, aufweist, und wobei das erste Ende des Fixierelements (45; 45a; 45b) den Vorsprung bildet.

**3.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 2, wobei sich die Fixierelementbuchse (412) von der ersten Seite (4101) zu der zweiten Seite (4102) des Schaltknopfes (41) hin erstreckt, aber von dieser im Abstand angeordnet ist, und wobei das Fixierelement (45) ferner ein zweites Ende aufweist, das an eine Endwand der Fixierelementbuchse (412) anstößt.

**4.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 2, wobei das Loch (25) des Körpers (20) eine Widerlagerwand (26) aufweist, wobei die zweite Seite (4102a) des Schaltknopfes (41a) schwenkbar an die Widerlagerwand (26) anstößt, wobei die Fixierelementbuchse (412a) sich von der ersten Seite (4101a) durch die zweite Seite (4102a) des Schaltknopfes (41a) erstreckt, und wobei das Fixierelement (45a) ferner ein zweites Ende aufweist, das schwenkbar an die Widerhakenwand (26) anstößt.

**5.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 2, wobei das Fixierelement (45; 45a) fest ist und kreisförmige Querschnitte hat.

**6.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 2, wobei das Fixierelement (45b) fest ist und rechtwinklige Querschnitte hat.

**7.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 3, wobei das Fixierelement (45a) und der Schaltknopf (41) jeweils eine Härte haben, die größer ist als die Härte der Klinke (42).

**8.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 4, wobei das Fixierelement (45a) eine größere Härte hat als die Klinke (42).

**9.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 2, wobei die Drückelementbuchse (411, 411a) und die Fixierelementbuchse (412; 412a) sich senkrecht zu der Schwenkachse (S) erstrecken, pa-

rallel zueinander sind und entlang der Schwenkachse (S) im Abstand zueinander angeordnet sind.

**10.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 1, wobei die Drückelementbuchse (411; 411a) sich von der ersten Seite (4101; 4101a) zu der zweiten Seite (4102; 4102a) des Schaltknopfes (41; 41a) hin erstreckt, aber im Abstand von ihr angeordnet ist, wobei das elastische Teil (43) ferner ein zweites Ende hat, das an einer Endwand der Drückelementbuchse (411; 411a) anstößt, wobei die zweite Seite der Klinke (42) einen eingesenkten Abschnitt (422) aufweist, und wobei das erste Ende des Drückelements (44) gegen den eingesenkten Abschnitt (422) drückt.

**11.** Umschaltbarer Ratschenschlüssel gemäß Anspruch 3, wobei der Körper (20) zwei Begrenzungsabschnitte (27) zwischen der Kammer (24) und dem Loch (25) aufweist, und wobei die zwei Begrenzungsabschnitte (27) in einer Breitenrichtung senkrecht zu der Schwenkachse (S) im Abstand voneinander angeordnet sind, wobei eine Schwenkbewegung des Schaltknopfes (41; 41a) um die Schwenkachse (S) gestoppt wird, wenn das Drückelement (44) einen der beiden Begrenzungsabschnitte (27) kontaktiert und von diesem gestoppt wird.

**Revendications**

**1.** Clé à cliquet réversible comprenant :

un corps (20) comprenant une partie opérationnelle (21) et une extrémité d'entraînement (22) raccordée à la partie opérationnelle (21), avec la partie opérationnelle (21) adaptée pour être saisie par un utilisateur, avec l'extrémité d'entraînement (22) qui comprend un espace de réception (23) et un compartiment (24) en communication mutuelle avec l'espace de réception (23), avec le corps (20) qui comprend en outre un trou (25) qui fait communiquer mutuellement le compartiment (24) avec un extérieur ;
un élément d'entraînement (30) monté dans l'espace de réception (23), avec l'élément d'entraînement (30) qui peut tourner autour d'un axe de rotation (C) par rapport à l'extrémité d'entraînement (22) du corps (20), avec l'élément d'entraînement (30) qui comprend une partie d'entraînement (31) adaptée pour entraîner directement ou indirectement une fixation, avec l'élément d'entraînement (30) qui comprend en outre une partie dentée annulaire (32) sur sa périphérie externe ;
un cliquet (42) reçu de manière coulissante dans le compartiment (24), avec le cliquet (42) qui comprend un premier côté ayant une partie dentée (421) mise en prise, de manière dégageable, avec la partie dentée annulaire (32) de l'élément d'entraînement (30), avec le cliquet (42) qui comprend en outre un second côté ;
un bouton de commutation (41 ; 41a) reçu dans le trou (25) du corps (20), avec le bouton de commutation (41 ; 41a) pouvant pivoter par rapport au corps (20) autour d'un axe de pivot (S) parallèle à l'axe de rotation (C), avec le bouton de commutation (41 ; 41a) qui comprend un premier côté (4101 ; 4101a) faisant face au compartiment (24) et un second côté (4102 ; 4102a) opposé au premier côté (4101 ; 4101a), avec le bouton de commutation (41 ; 41a) qui comprend en outre un réceptacle d'élément de pression (411 ; 411a) s'étendant à partir du premier côté (4101 ; 4101a) vers le second côté (4102 ; 4102a) ;
un élément élastique (43) reçu dans le réceptacle d'élément de pression (411 ; 411a) ; et
un élément de pression (44) reçu dans le réceptacle d'élément de pression (411 ; 411a) et ayant une première extrémité positionnée à l'extérieur du réceptacle d'élément de pression (411 ; 411 a), avec la première extrémité de l'élément de pression (44) qui a un premier espacement (L1) par rapport au premier côté (4101 ; 4101a) du bouton de commutation (41 ; 41a), avec la première extrémité de l'élément de pression (44) sollicitée par l'élément élastique (43) pour appuyer contre le second côté du cliquet (42), provoquant la mise en prise entre la partie dentée (421) du cliquet (42) et la partie dentée annulaire (32) de l'élément d'entraînement (30) ; et
une saillie prévue sur le premier côté (4101 ; 4101a) du bouton de commutation (41 ; 41a) et comprenant une partie de contact (451 ; 451a) ayant un second espacement (L2) par rapport au premier côté (4101 ; 4101a) du bouton de commutation (41 ; 41a),

dans laquelle le bouton de commutation (41 ; 41a) est opérationnel pour pivoter par rapport au corps (20) pour changeur une direction d'entraînement et une direction sans entraînement du corps (20), dans laquelle l'élément d'entraînement (30) et la fixation couplée à l'élément d'entraînement (30) sont adaptés pour tourner conjointement avec le corps (20) alors que le corps (20) tourne dans la direction d'entraînement, et dans laquelle l'élément d'entraînement (30) et la fixation couplée à l'élément d'entraînement (30) sont adaptés pour rester encore, lorsque le corps (20) tourne dans la direction sans entraînement,
dans lequel le cliquet (42) coulisse dans le compartiment (24) et est comprimé par l'élément de pression (44) pour se dégager de la partie dentée annulaire

(32) de l'élément d'entraînement (30) alors que le corps (20) tourne dans la direction sans entraînement, et le premier espacement (L1) de l'élément de pression (44) n'est pas plus petit que le second espacement (L2) de la saillie,
**caractérisée en ce que**, si le cliquet (42) coulisse dans le compartiment (24) alors que le corps (20) tourne dans la direction sans entraînement et si le cliquet (42) comprimé par l'élément de pression (44) ne se dégage pas de la partie dentée annulaire (32) de l'élément d'entraînement (30), la partie de contact (451 ; 451a) de la saillie appuie contre le cliquet (42) pour dégager le cliquet (42) de la partie dentée annulaire (32) de l'élément d'entraînement (30) lorsque l'élément élastique (43) est comprimé, dans la mesure dans laquelle le premier espacement (L1) de l'élément de pression (44) n'est pas plus grand que le second espacement (L2).

**2.** Clé à cliquet réversible selon la revendication 1, avec le bouton de commutation (41 ; 41a) qui comprend en outre un réceptacle d'élément de fixation (412 ; 412a) s'étendant à partir du premier côté (4101 ; 4101a) vers le second côté (4102 ; 4102a) du bouton de commutation (41 ; 41a), avec un élément de fixation (45 ; 45a ; 45b) reçu dans le réceptacle d'élément de fixation (412 ; 412a) et ayant une première extrémité exposée à l'extérieur du réceptacle d'élément de fixation (412 ; 412a) et avec la première extrémité de l'élément de fixation (45 ; 45a ; 45b) qui forme la saillie.

**3.** Clé à cliquet réversible selon la revendication 2, avec le réceptacle d'élément de fixation (412) qui s'étend du premier côté (4101) vers le second côté (4102) du bouton de commutation (41) tout en étant espacé de ce dernier, et avec l'élément de fixation (45) qui comprend en outre une seconde extrémité en butée contre une paroi d'extrémité du réceptacle de l'élément de fixation (412).

**4.** Clé à cliquet réversible selon la revendication 2, avec le trou (25) du corps (20) qui comprend une paroi de butée (26), avec le second côté (4120a) du bouton de commutation (41 a) qui vient en butée de manière pivotante contre la paroi de butée (26), avec le réceptacle d'élément de fixation (412a) qui s'étend à partir du premier côté (4101 a) en passant par le second côté (4102a) du bouton de commutation (41a), et avec l'élément de fixation (45a) qui comprend en outre une seconde extrémité qui vient en butée de manière pivotante contre la paroi de butée (26).

**5.** Clé à cliquet réversible selon la revendication 2, dans laquelle l'élément de fixation (45 ; 45a) est solide et a des sections transversales circulaires.

**6.** Clé à cliquet réversible selon la revendication 2, dans laquelle l'élément de fixation (45b) est solide et a des sections transversales rectangulaires.

**7.** Clé à cliquet réversible selon la revendication 3, dans laquelle chacun parmi l'élément de fixation (45) et le bouton de commutation (41) a une dureté supérieure à une dureté du cliquet (42).

**8.** Clé à cliquet réversible selon la revendication 4, dans laquelle l'élément de fixation (45a) a une dureté supérieure à une dureté du cliquet (42).

**9.** Clé à cliquet réversible selon la revendication 2, dans laquelle le réceptacle d'élément de pression (411 ; 411a) et le réceptacle d'élément de fixation (412 ; 412a) s'étendent perpendiculairement à l'axe de pivot (S), sont parallèles entre eux et sont espacés l'un de l'autre le long de l'axe de pivot (S).

**10.** Clé à cliquet réversible selon la revendication 1, avec le réceptacle d'élément de pression (411 ; 411 a) qui s'étend à partir du premier côté (4101 ; 4101 a) vers le second côté (4102 ; 4102a) du bouton de commutation (41 ; 41 a) tout en étant espacé de ce dernier, avec l'élément élastique (43) qui a en outre une seconde extrémité venant en butée contre une paroi d'extrémité du réceptacle d'élément de pression (411 ; 411a), avec le second côté du cliquet (42) qui comprend une partie évidée (422) et avec la première extrémité de l'élément de pression (44) qui appuie contre la partie évidée (422).

**11.** Clé à cliquet réversible selon la revendication 3, avec le corps (20) qui comprend deux parties de limitation (27) entre le compartiment (24) et le trou (25), et avec les deux parties de limitation (27) espacées l'une de l'autre dans le sens de la largeur perpendiculaire à l'axe de pivot (S), dans laquelle le mouvement de pivot du bouton de commutation (41 ; 41a) autour de l'axe de pivot (S) est arrêté lorsque l'élément de pression (44) est en contact et est arrêté par l'une des deux parties de limitation (27).

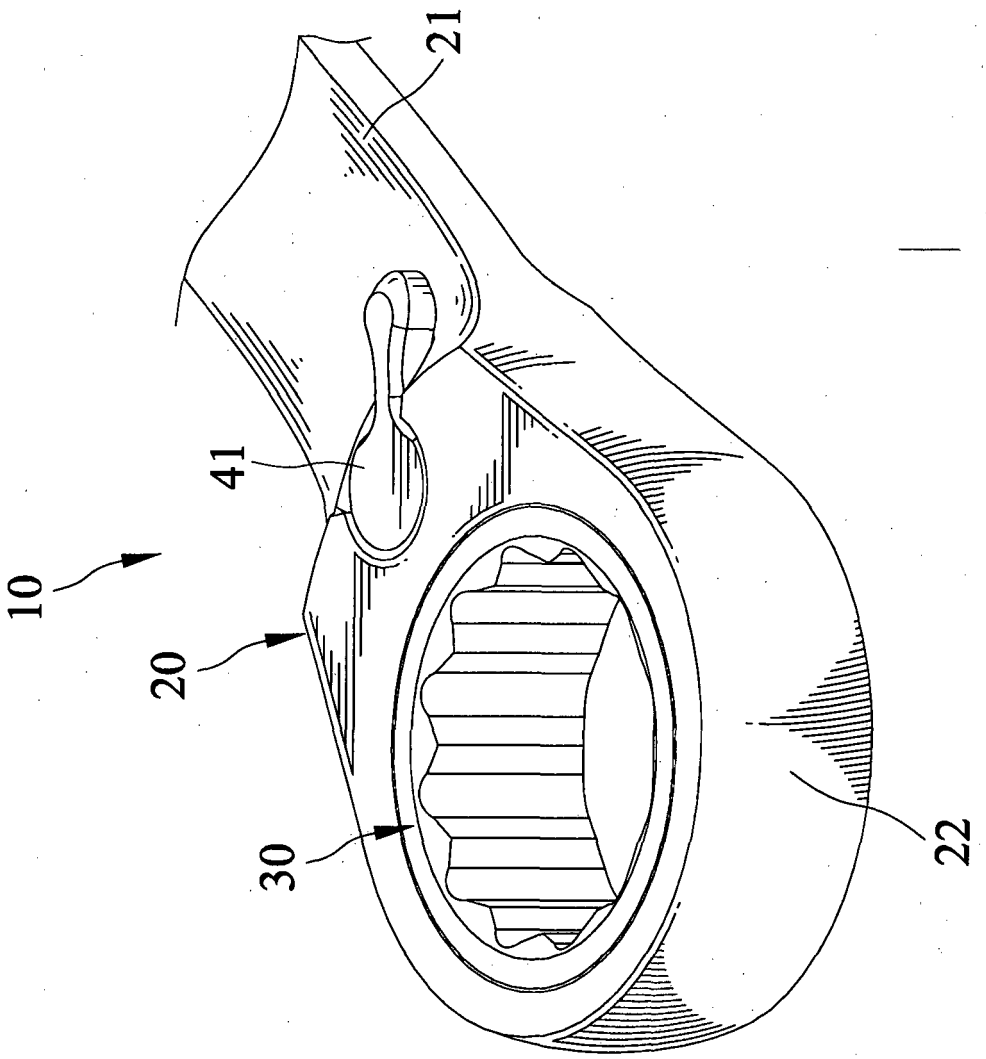


FIG. 1

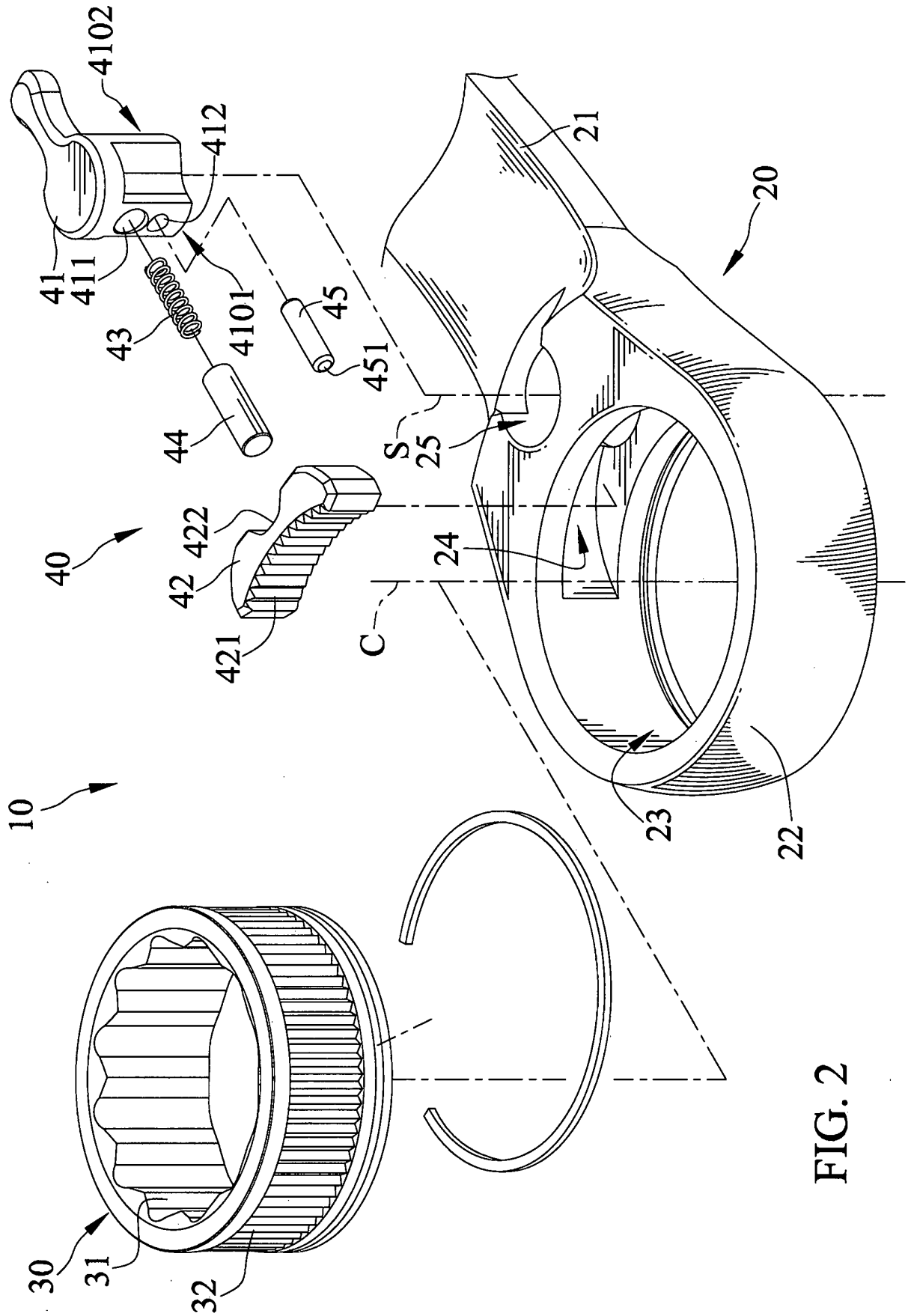
4102
412
41
411
4101
43
45
451
44
S
25
21
20
40
422
42
421
24
C
10
23
22
30
31
32

FIG. 2

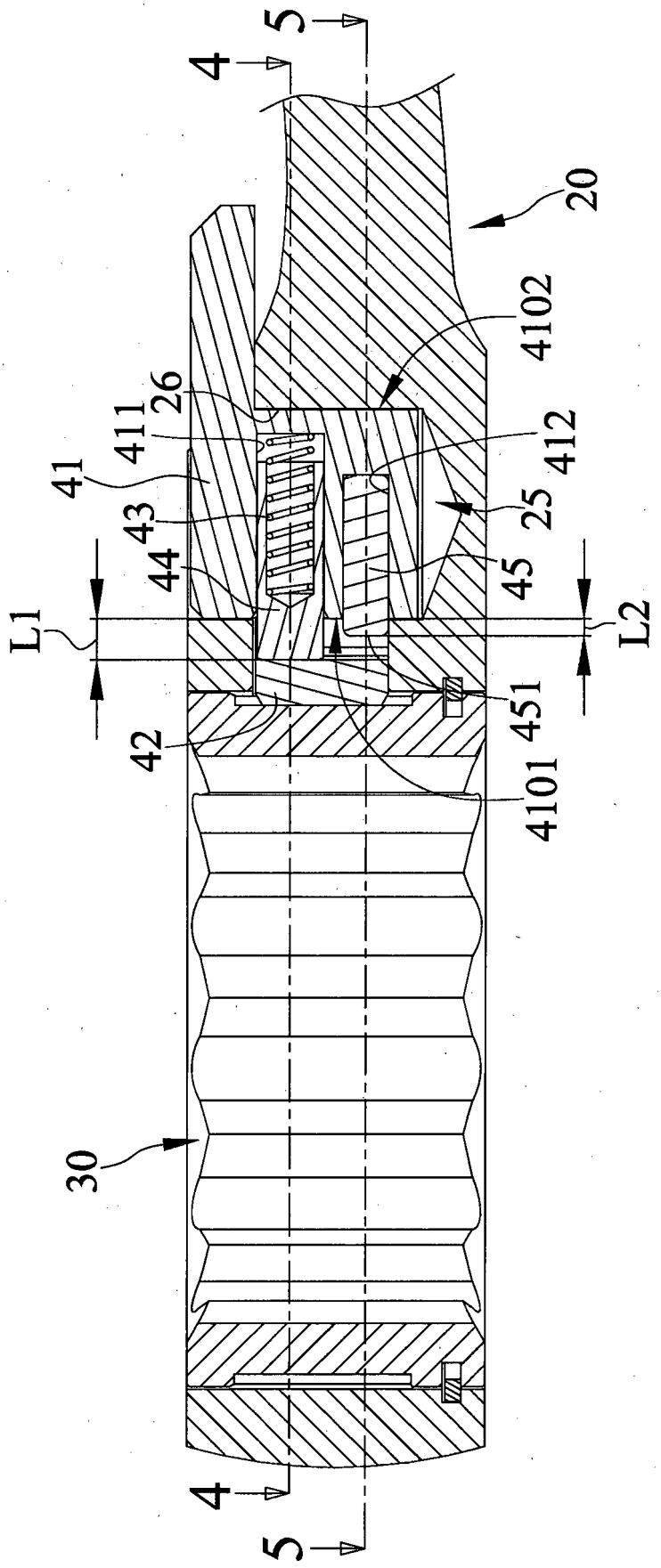


FIG. 3

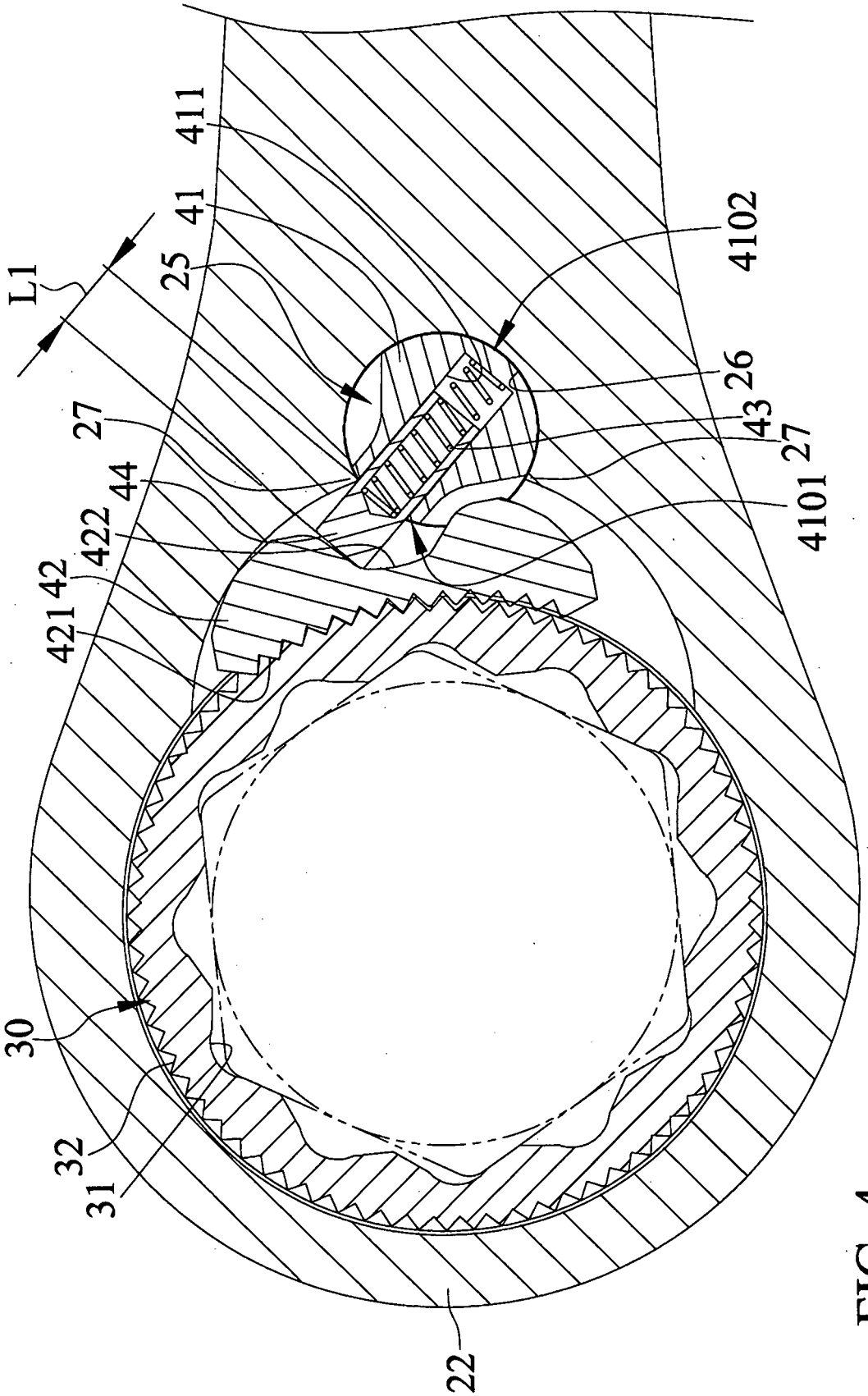


FIG. 4

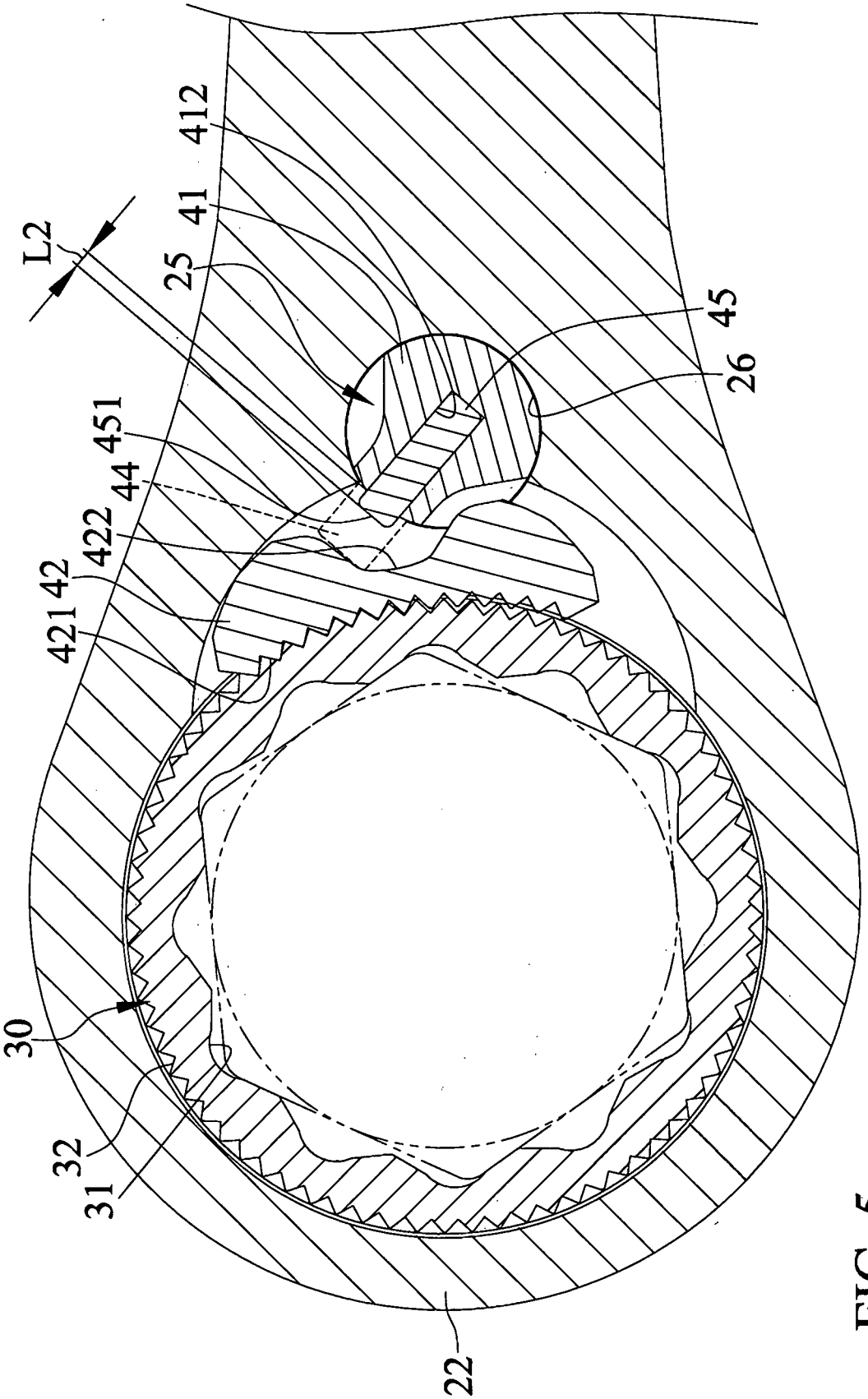


FIG. 5

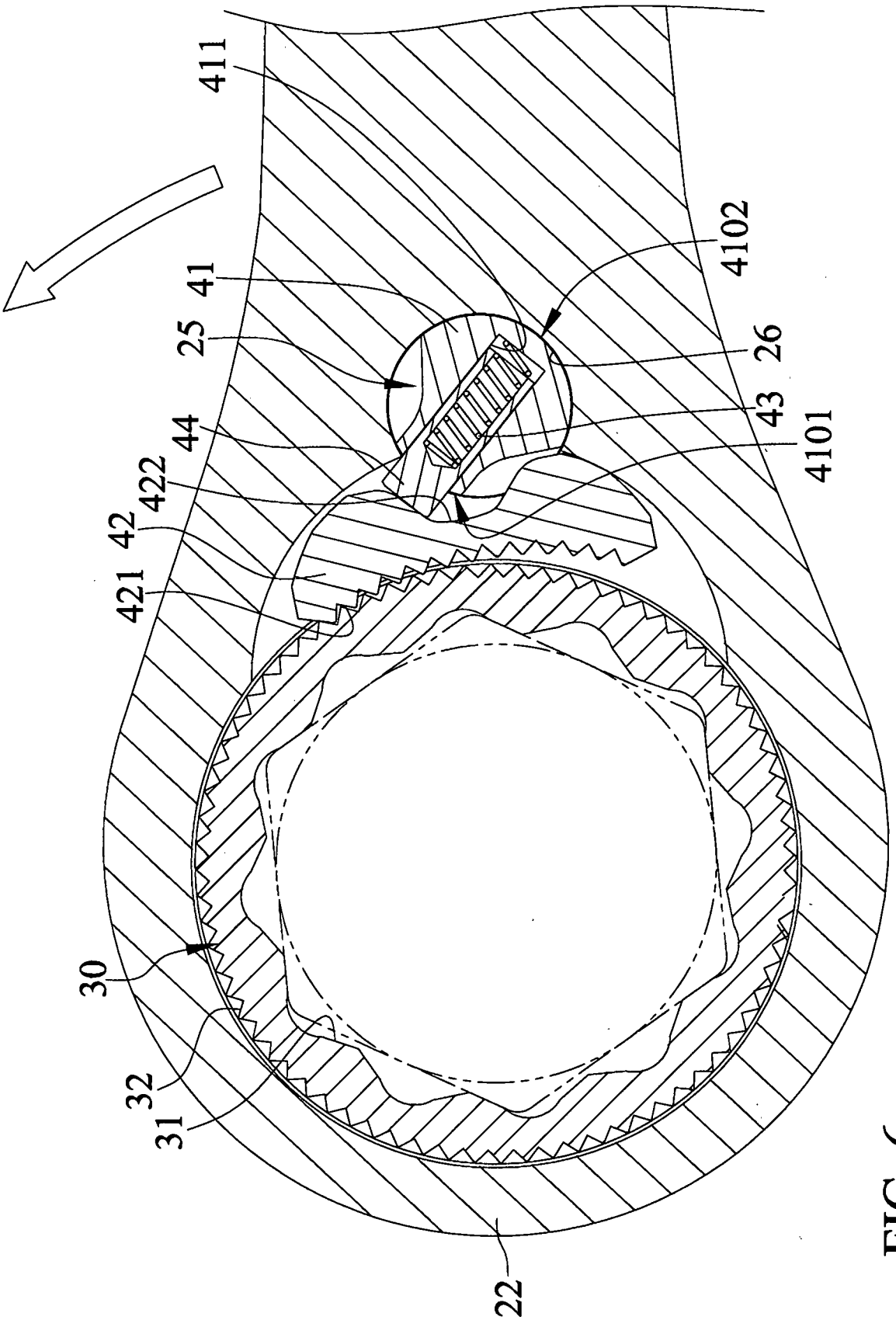


FIG. 6

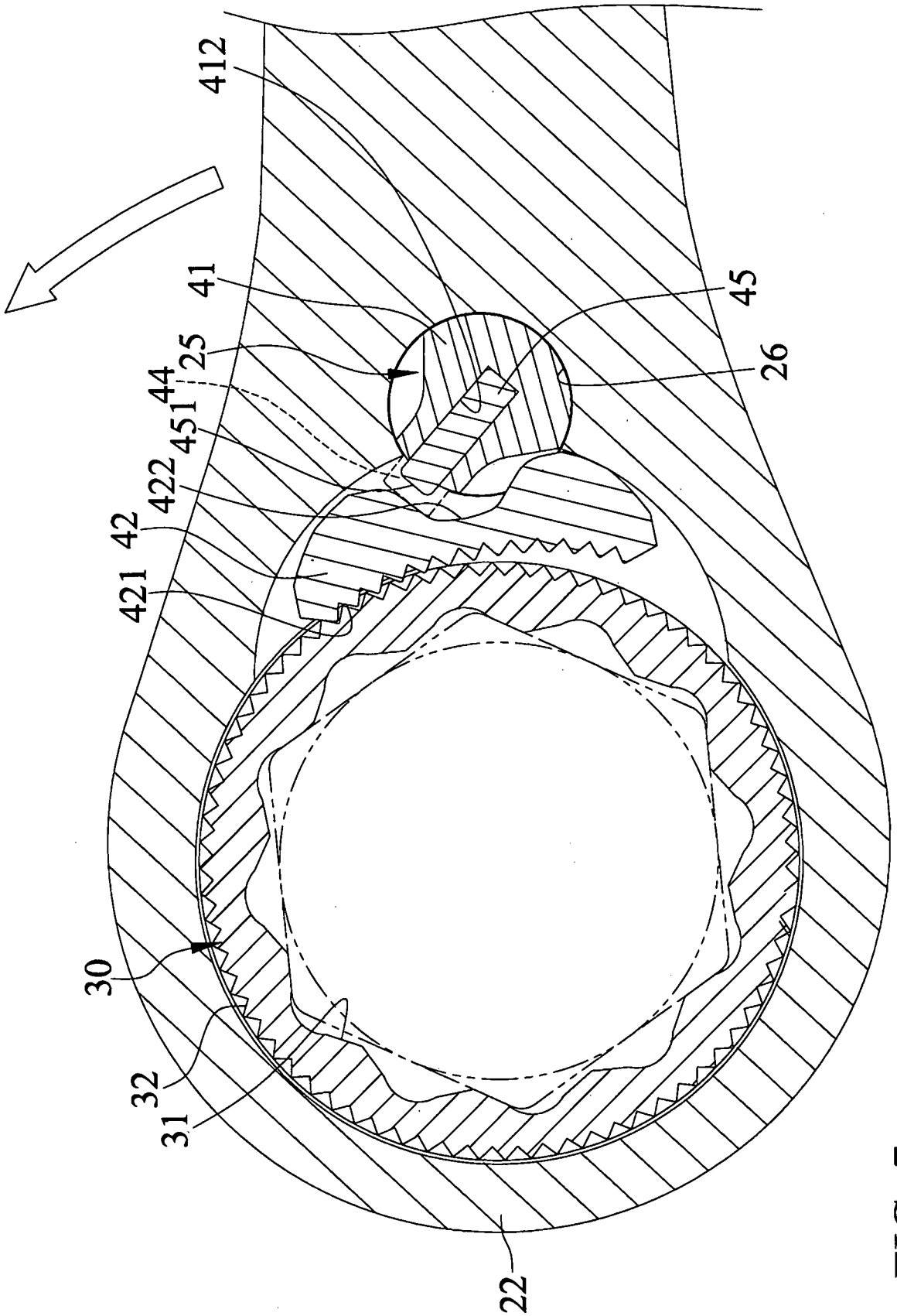


FIG. 7

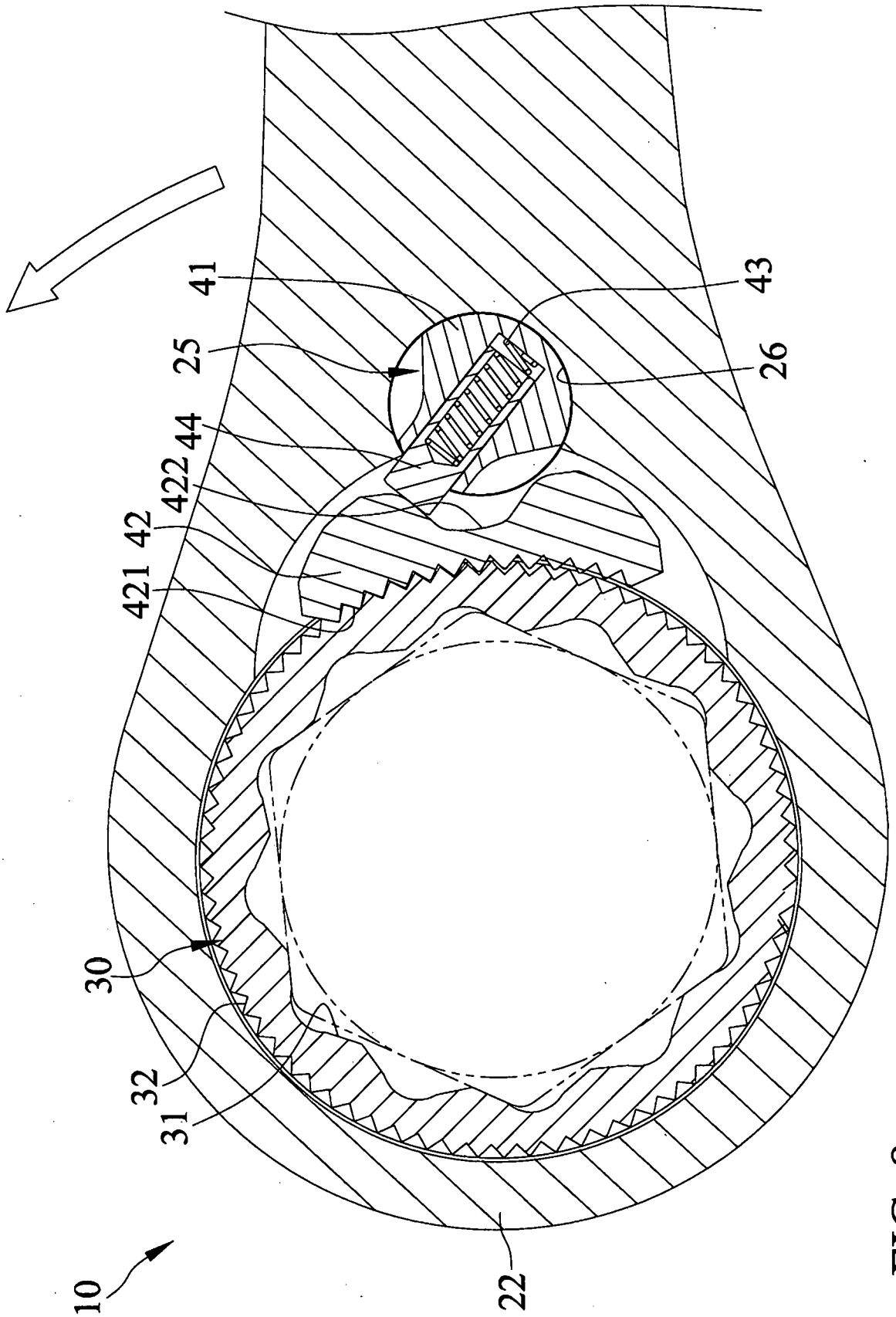


FIG. 8

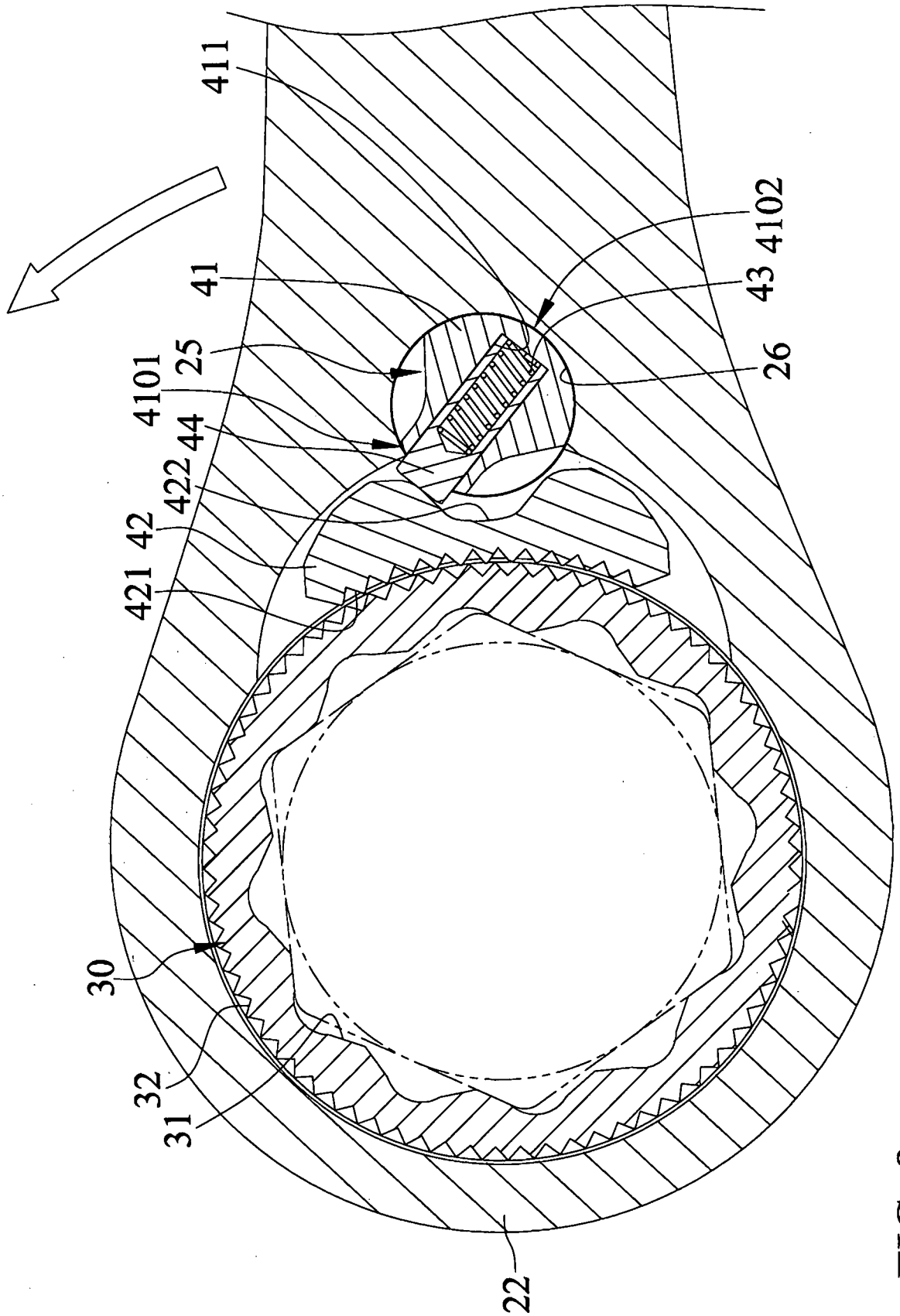


FIG. 9

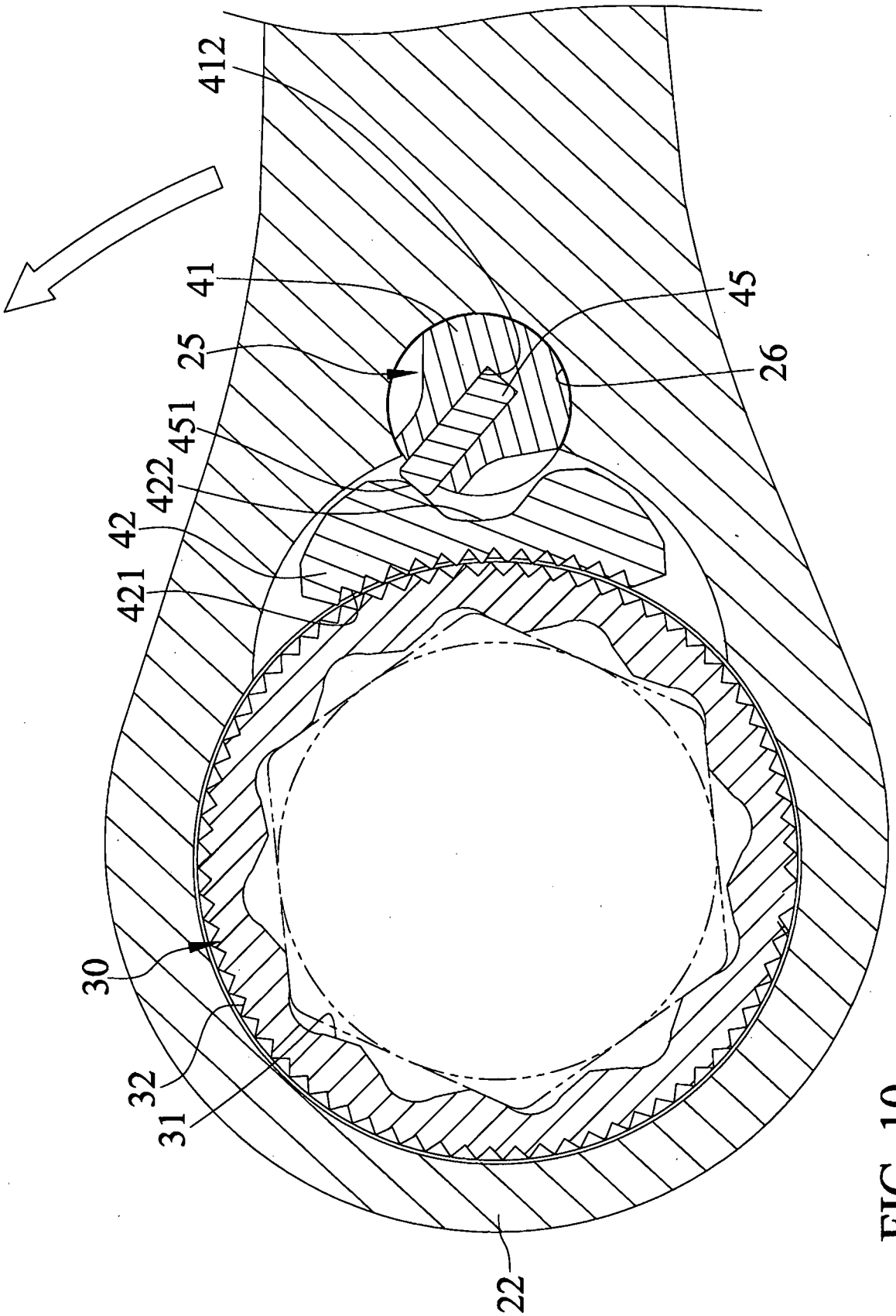


FIG. 10

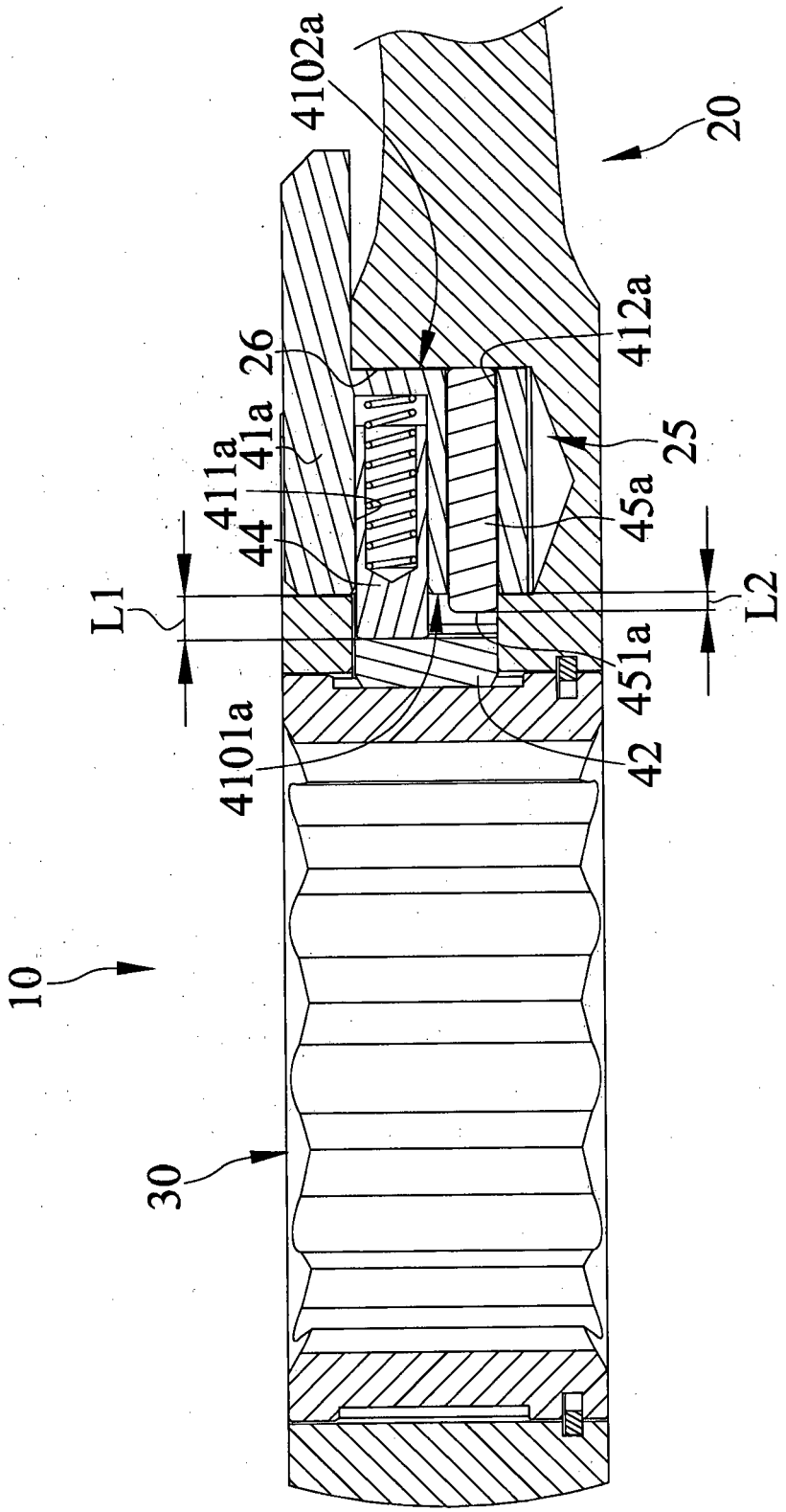


FIG. 11

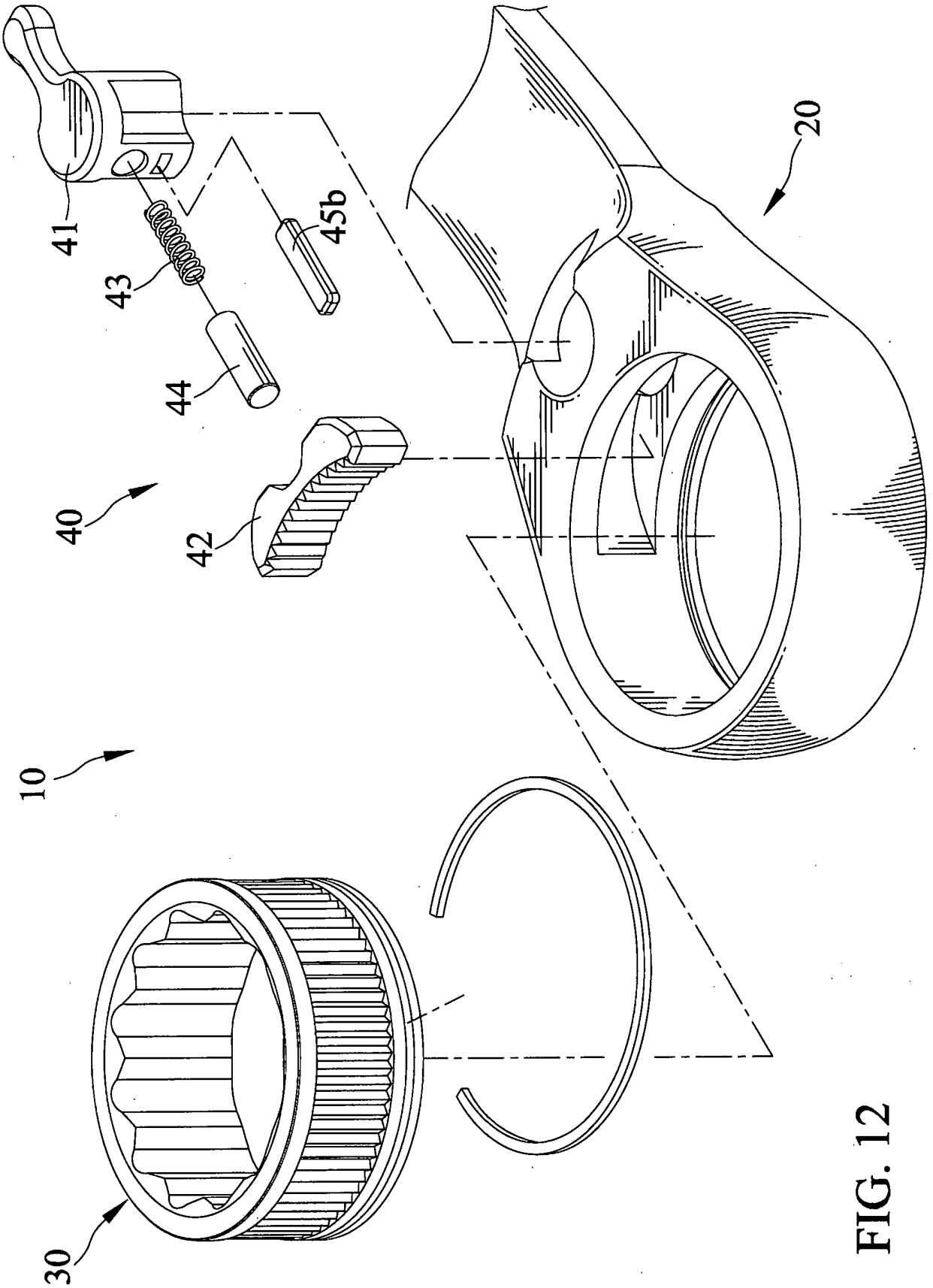


FIG. 12

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- US 20090038444 A1 **[0001]**
- US 6629477 B **[0002]**